

Report from Working Group 1

Elements of a functional national management program and ensuring adequate information for non-detriment findings

The group identified seven general recommendations that could enhance monitoring efforts, improve management and facilitate implementation of the CITES Appendix II listing:

1. Efforts to develop maps of marine environment, illustrating spatial extent of different habitat types, seahorse distribution and fishing areas and use these as a tool to implement management approaches (e.g., demarcate fishing and no-fishing zones) should be promoted. As a first step, existing maps at the available resolution (e.g., WCMC World Atlas of Seagrasses, Mangroves and Coral Reef maps at a 4 km scale) should be refined to the highest level of detail possible once more information becomes available.
2. Parties should use the best available data on seahorse fisheries and trade as guidance to identify key locations where seahorses are targeted or taken as bycatch to identify areas for initial management and monitoring initiatives. One source of existing information is the country reports developed by Project Seahorse.
3. An email contact group should be created with the goal of establishing pilot seahorse management and monitoring programs/projects and for information-sharing (e.g. observer programs in place). Another goal of this group would be to improve communication among CITES authorities, FAO officials, fishery agencies and scientists.
4. The working group recognizes that the direct take or harvest of seahorses as bycatch may only represent a few animals per fishers or vessel per day. This amount of take could still impact populations over time because of the patchy, low abundance and vulnerable life history traits of these species. Total harvest over multiple trips may be substantial, especially when the entire fleet is large. Destruction or alteration of habitat might be as important or even more than direct take or bycatch.
5. Parties should continue to collect, analyze and apply fishery dependent and fishery independent data towards improved seahorse management. Observer programs could determine this.
6. As an initial management measure, Parties should consider adoption of a voluntary minimum size of 10 cm height for exports from wild populations. This recommendation may be refined over time as more is learned about various species of seahorses.
7. The management of seahorse fisheries should be considered in the larger context of habitat conservation and mitigation of threats such as land-based pollution, inappropriate coastal development, and destructive fisheries practices (trawling, cyanide and blast fishing).

1. Identify and list practical means for quantifying seahorse catch and landings, accounting for harvest variation in time, space and gear types.

Target Fisheries

- Parties should set mandatory reporting requirements. One approach could include logbooks that detail fishing area, season, and catch and effort in target fisheries.
- Parties should interview fishers to expand historical data sets and obtain information on current practices
- Parties should encourage the formation of local or community-based fishing cooperatives to improve coordination, data collection and information- sharing with resource managers.
- Parties should explore the possibility of including seahorse fishers, and seahorse collection sites under existing certification programs for ornamental fisheries (e.g., MAC) to assist in making non-detriment findings (NDFs).
- Parties should work closely with fishers in the field to obtain fisheries data. Where taking of seahorses is legal conservation needs and the value of reliable, accurate fisheries dependent data should be emphasized, thereby improving the likelihood that fishers will accurately report data.

Bycatch

- Observer programs are the most important tool to better understand the distribution of effort, species diversity and level of bycatch:
 - a. Observers could be placed on board vessels or at ports (e.g. shrimp trawl fleet). Port samplers may be able to maximize number of vessels that are monitored with limited effort; placing observers on boats would allow data collection from a maximum of one boat per observer. Disadvantage of port inspection is that data is available on retained bycatch and not discards. Also, on vessels with multiple crew, individual fishers each may keep a portion of the seahorses landed and thus accurate sampling is not possible without direct observation.
 - b. Observers should monitor more than just seahorses. All bycatch might be monitored or specific species of interest might be counted (e.g., rare species, species of concern due to overexploitation, key habitat forming invertebrates, and juveniles of commercially important species). Usually, programs are biased toward the more abundant and conspicuous species. Technical advice to collect data on species of low abundance as seahorses is needed.
 - c. Where seahorse bycatch is retained, observers should identify and enumerate the entire seahorse catch, including sex, size and percentage of pregnant males, if feasible.

- d. Where seahorse bycatch is discarded, observers will be unable to analyze everything. Observers should take representative samples of discards, enumerate all fish and invertebrate bycatch, including seahorses, and relate sample size to total amount of bycatch. Sub-sampling may be suitable for seahorses, because of their low abundance and low level of catch; therefore, statistical analysis and methodologies for sampling need to be developed.
 - e. It would be advantageous to spread observer effort over as wide a geographical area as possible. Once some information on focal areas of interest (main catch areas or areas with high incidence of seahorses or suitable habitat) is obtained, observer effort could be redefined as appropriate.
 - f. Observers need training in how to effectively work with fishers to gain their trust, and also in species identification, data sampling and collection. One possible way to implement observer programs is by involving university scientists/students, who may be more able to establish a good working relationship with fishers than government representatives.
 - g. It is critical that managers share information with neighboring countries and work to establish standardized recording procedures so data from neighboring areas is comparable.
 - h. Australia, the U.S. and other countries with observer programs should provide capacity building / training/aid programs to develop fisheries observer programs in other countries and to provide training in methodologies to analyze and interpret data. One example would involve a simplified regional identification guide that includes only local species for use by observers in collection areas.
 - i. The possibility of monitoring the movement (fishing areas) of vessels was considered, maybe by using a GPS system. Although this can be very useful and desirable, it might not be economically feasible in some cases.
- Parties could require that captains of vessels involved in the take of seahorse bycatch maintain logbooks on bycatch. Most trawl fisher fleets have logbooks for commercial and bycatch species. It might be useful to have an additional logbook for protected species (including seahorses). This may be a cost-effective approach, but there is no assurance of data quality, especially if logbooks are not completed during fishing.
 - Bycatch in artisanal fishery - Evaluate its impact and levels: Which kind of artisanal fishing gear can have a more direct impact on seahorse populations? Also there could be some sampling, observers, interviews, and collaboration with fishers to keep track of data gathering. Cross data with salesmen, fishers and observers as well. This activity can have an important impact on key seahorse habitat areas (e.g. breeding or spawning areas).

2. List elements of a workable licensing or reporting mechanism for fishermen, dealers, and exporters.

Target Fisheries

- Parties should require at a minimum a license for ornamental fisheries in general, or at least a specific license for seahorse fishers. This provides a tool to determine the total number of fishers and probably as a first effort control, by restricting the number of licenses.
 - a. Data/logbooks should be submitted once per year at a minimum for renewal of a license. Difficulties with this approach are that fishers may not record data until just before they renew license, decreasing accuracy of data.
 - b. Detailed information of catches (species level) should be reported for each trip; monthly reporting may be a substitute for reporting for each trip in order to obtain seasonal data. These reports might be mandatory for re-issuing of the licenses.
- Parties should encourage formation of fishing cooperatives and “management councils” that include resource agencies at a local and national level as well as stakeholders and user groups to facilitate cooperation. These cooperatives could be responsible for ensuring that fishers know how to fill out logbooks in order to ensure their accuracy. Cooperatives could also teach conservation approaches, recommend ways to enhance sustainability and product quality, and set standards to maximize product quality and value. Dealers might also be invited to participate in cooperatives. The Philippines is already implementing this approach.
- It may not be necessary to specially license exporters since they may already need licenses to obtain export permits from the CITES Management Authority or because there are other types of specific regulations for the country, but might be useful if the system is not in place yet.
- Licenses and permits for dealers could provide 1) information on total number of dealers, 2) track movement of products within country, 3) determine concentration centers of products, and 4) facilitate inspection and enforcement. This also provides a cross check for data provided by fishers and exporters. If it is impractical to license or permit dealers, at the minimum resource, management agencies should have a list of all dealers. Each Party should develop a specific mechanism adapted to their needs.
- A certification program such as that provided by the Marine Aquarium Council (MAC) provides one tool to track seahorses and other ornamentals from the reef to the retailer, providing data on collection area, size, sex and stage, and total level of take and effort.

Examples:

- Mexico requires fishers that target ornamental species or species under special protection (e.g., seahorses) to hire a research center/university/biologist to assess the resource and determine whether the potential level of offtake is non-detrimental. Researchers have recommended that take be restricted to 10% of a population per year (0.81% per month) within specific collecting area.

- Philippines now requires licenses for fishers, but do not restrict license holders to particular species; exporters also licensed. Philippines has a banned species list, but will give fishers specific licenses for these species for research purposes for one year to collect information on those species. All catch needs to be shown to enumerators, but can be sold after verification. This limits illegal harvest. Licensing is handled by local governments and fishing cooperatives are recommended, with national government providing assistance. Fisheries and aquatic resources management councils are composed of local, national governments, fishing cooperatives and fishers.
- In Florida, fishers are licensed for particular species or groups and must provide trip tickets. There are specific marine life licenses for ornamentals. Dealers are also licensed.

3. List elements of accurate fishery-independent population surveys for wild seahorses (design, gear, execution), considering habitat types and fishery location.

- The approach used will vary depending on the habitat (e.g., a trawl would not be effective in a coral reef while visual (dive) surveys may not be practical in shallow grassbeds).
- Parties should identify existing monitoring programs and approaches. If a commercial fishery has a stock assessment protocol, it should be evaluated to see whether seahorse monitoring could be added. Another gear type or additional species could be added to an existing program.
- Any program should include standardization whenever possible of gear types, methodologies, statistical analysis and previous training, with specific gear types for certain habitats, species or depths.
- Fishers should be involved in field monitoring programs if possible; this can be particularly useful to determine tendencies within an adaptive management approach.
- Monitoring should be conducted in fished and non-fished areas, within similar habitat types, to provide a means to separate fishery impacts from other stressors/disturbances. Some risk factors that might be taken into account are habitat destruction and pollution.
- Selection of survey areas should consider previous mapping and areas with a higher probability to find seahorses.
- Monitoring programs should be for seahorses and other associated species. Ideally, as many species as possible should be recorded in surveys with detailed information on species, abundance, size and sex whenever possible. This can help the surveys to be more useful, practical and economically viable, and also to have the needed support.
- The WG debated on the convenience and likelihood of developing standardized format sheets to collect all the relevant data.
- Some specific tools could include a drop net for seagrasses and fine mesh trawls for deeper non-coral areas. In coral reefs, typical belt transect surveys and stationary surveys (Bohnsack approach) used for larger mobile reef fishes will probably not work for more cryptic seahorses. However roving diver surveys (timed swims) may be useful in identifying rare species, although it is difficult to quantify numbers per area.

- Although seahorses are occasionally targeted at night, it is not practical to survey at night on a large scale due to decreased efficiency and increased cost. However, general surveys can be complemented by night samplings, which have been proven to be useful in some areas. Even if daytime surveys underestimate actual abundance, they can still estimate changes in populations over time.
- The MACTRAQ monitoring program is a visual survey approach developed in partnership with ReefCheck and MAC for the ornamental fishery. It should be evaluated to see if it could provide useful data on seahorses.
- Research institutions should be encouraged to share their information and identify main areas for seahorses surveys and map habitats. Also, communication with them should be increased to contribute in their surveys design so that information to answer key questions for management and making NDFs can be generated.

4. Evaluate the pros and cons of the proposed fishery management tools from a biological, economic and enforceability standpoint.

General recommendations

- Parties should evaluate and consider FAO's "Code of Conduct for Responsible Fishing" which identifies numerous approaches to conserve marine resources, with emphasis on an ecosystem approach.
- The World Summit on Sustainable Development (2003) passed a recommendation that all countries set aside 10% of marine environments as no-take by 2012. This approach will help to conserve seahorses by protecting their habitat.
- One approach to address concerns over sustainability of seahorses taken as bycatch is through area closures (spatial closures or rotating harvests with long closures between fishing periods to allow habitat recovery). More research is necessary to determine survival rates of species caught through bycatch. Possible measures to enhance survival also should be tested (e.g., duration of individual tows). Potential socioeconomic implications should be considered.

A. Size restriction for export

- Minimum size can only be realistically applied to target fisheries, until research is conducted to determine optimal strategies to maximize survival of bycatch under different trawling conditions (e.g., depth, duration of gear deployment). Currently, application of this measure to bycatch fisheries may result in wastage due to discards of smaller animals that die. Some species may be caught both through target and non-target fisheries. Not including a minimum size for species taken as bycatch may create a loophole for target fisheries if a minimum size for target fisheries is mandatory. Size limits should not be applied to aquacultured specimens.
- There may be some reduction of yield (fecundity) associated with removal of largest animals, but implementation of a maximum size is not practical because different species of seahorses grow to

different maximum sizes. This approach would not be supported by TCM markets due to higher value/demand of large specimens. Also, seahorse fecundity does not appear to increase exponentially with size as seen in long-lived species like groupers. Thus the benefits gained by protecting the largest animals may not be offset by economic losses. It is not clear if larger animals effectively contribute with more offspring and thus an important reduction of fertility can be inflicted by catching larger animals. Topological studies in seahorses are needed to determine this.

- Continued pressure on the largest animals may result in a progressive long-term shift (decline) in the size at maturity, which may cause reductions in number of offspring.
- The WG proposes to explore the possibility of two minimum sizes to account for the larger maximum size of *H. kelloggi*, *H. ingens* and *H. abdominalis* (e.g. minimum export size for these could be 20 cm). However, it may be difficult to differentiate these three from other species. Additionally, *H. kelloggi* is reported to be taken primarily in deeper water by trawls and there may be even more waste associated with discards of small animals. Some expressed concerns that a 10 cm minimum size may exclude certain species that have recently appeared in live trade (e.g., *H. bargibanti*). Thus it may be appropriate to identify certain species that might be exempt from minimum size limits. Simple ways to identify these species and to ensure that other species with a larger maximum size are not traded as juveniles should be found.
- More research is necessary on size specific fecundity, longevity and reproduction and to develop a conversion factor between proposed “trade height” and length for all species to facilitate inspections and enforcement.
- The importance of domestic markets should be considered when setting a minimum export size because small animals may still be retained and sold locally for curios, TCM, Jamu etc.
- If CITES makes the recommendation that countries could use a minimum size as an initial measure for non-detriment, it should be with the recognition that the benefit of this measure from a biological standpoint will depend on the species and location, and other measures should be considered based on available knowledge.
- Variations in the proportion of different traded species to total height must be quantified.

B. Spatial closures

- While spatial closures are currently the only “simple” way to address unsustainable bycatch, removal of juveniles and habitat degradation associated with fishing, there is likely to be considerable opposition by fishers on any limits to where they can fish as a result of potential socioeconomic impacts.
- Depending on level of community support, distance from communities, existing capacity, and the amount of fishing by nonresidents, it may be difficult to enforce spatial closures.
- There are already closures for trawl fisheries in inshore shallow waters in Thailand (3 km), Malaysia, Philippines (15 km), Indonesia, and Mexico (0-5 fathoms depth and 5 km from river mouths, estuaries and bays).

- Research is needed to determine if these nearshore areas are prime seahorse habitat and whether this protective measure can help sustain surrounding fished areas. Nearshore areas are known to provide nursery grounds for other food fishes. Research could also be focused on identifying key areas for seahorses reproduction, vulnerable habitats or areas characterized by a high diversity or presence of rare seahorse species.
- Closures have clear benefits to habitats and all species that occur in these habitats, and may enhance fisheries in surrounding open areas, but proper design is a key consideration. The science of area restrictions is in its infancy – what species benefit etc. needs to be evaluated.
- To be effective, closures should be developed through a consultation process with resource users. Training in benefits of this measure is a key element.
- If seahorses have small home ranges and if juveniles do not disperse to surrounding fished areas, these may offer minimal benefits for seahorse fisheries.

C. Temporal closures

- Temporal closures may benefit particular species or locations by restricting effort.
- Setting appropriate closures in areas with multiple species is difficult, due to variations in reproductive period.
- Temporal closures may be more effective for some temperate species that have shorter reproductive periods.

D. Rotational harvest

- This management measure is a combination of a spatial and temporal closure. With rotational harvest, habitat has an opportunity to recover.
- It is very difficult to enforce, since it is hard to notify fishers of closures and to identify specific areas.
- It is unclear whether this measure will benefit target species. Further data is needed on the fishery, along with fishery independent monitoring. The effects of different exploitation levels and different durations of closed and open periods should be investigated to determine the optimal timing for closures.

E. “Sex selective fishing” (not taking pregnant males) or “caging”

- This management measure consists of collecting animals and caging pregnant males until they give birth. Unless a high survival of animals taken as bycatch is found, these measures will only potentially be valuable for target fisheries.
- Research should accompany this measure to identify best placement of cages to address environmental (salinity, water quality, temperature etc.) and habitat concerns and to evaluate survival of juveniles.

- If caging is used, the spawning biomass of the animals should be determined to assess the value of protecting one brood, protecting multiple broods in one year, and the total number of broods in the seahorse lifespan to determine the benefits to the population.
- Research is needed to evaluate the potential implications of changes in sex ratio of wild populations.
- If sex selective fishing is chosen as a tool to enhance populations by managers, but fishers do not want to adopt this, they could “induce” birth by squeezing the brood pouch.

H. Total allowable catch or export

- It would be possible to control landings but not catch, except in the case of small-scale fisheries where buyers have a specific quota. Thus there could be wastage of undesirable animals once the fishers reach their quota.
- Substantial biological data would have to be collected in order to monitor populations for changes.
- The working group discussed the possible application of a maximum cap on exports equivalent to some historical mean annual level. It was decided that this would not be a good management tool without sufficient data. This measure could prevent unacceptable fisheries growth, but it has not been demonstrated to work in other fisheries. In addition, in most areas, seahorse populations are in decline and this approach could drive a resource to unacceptably low levels and contribute to sequential overfishing.

I. Tenure or Community-based management

- This technique provides for management by local communities. However, the working group had many concerns about its implementation, particularly where a community is already overfishing a resource.
- A high degree of technical training in how to manage the resources would be needed for this type of management.
- This technique can increase commitment of community to conserve and manage resources, but it requires that the community undertake monitoring of its resources.
- This method has worked historically when there was a lower population density and resources were harvested primarily for subsistence, not a “cash crop”
- Theoretically, this measure would reduce investment needed in enforcement by government agencies because the communities will police the area.

5. Identify pragmatic ways to change fishing effort or landings under an “adaptive management” approach for seahorses.

The Working Group believed that a possible approach to work towards sustainability could involve choosing pilot fisheries in one or more locations to evaluate possible options:

- For seahorse fisheries in general, adopt a voluntary minimum size for the May 2004 Appendix II listing.
- At the same time, implement a monitoring program to collect information on the response of this measure to trade (through CITES permits), population changes (fishery independent monitoring) and fisheries (catch/effort; observer programs).
- Assess data from monitoring program and judge the effect of this measure.
- If it appears to be working, continue this measure.
- If it is not working, modify the size limit and/or add additional measures.
- Continue monitoring resources and fishery over time to assess changes.
- Add new measures as necessary until you achieve sustainability.

Adaptive Management

Decision 12.54 directs the Animals Committee to identify minimum size as one component of an adaptive management plan. The working group recommends that all Parties do this. An adaptive management plan should be a consultative process, developed with input from stakeholders. It is explicitly experimental and iterative (learn, change, learn, change), and it is a process without end. Plans should be reviewed and revised on the timeframe of the lifespan of the seahorses it covers. Parties are encouraged to set up index (indicator or sentinel) fisheries for tracking changes as they occur. Adaptive management plans do not involve any radical new measures. Parties apply well-known and tested methods as they build capacity to determine the best measures and implement them. As the fishery is better understood, managers can take more complicated measures.

Additional Comments

In many cases, seahorses are only one component of ornamental fish trade. It is possible that a Party might have a management plan for ornamental fisheries overall, but due to export requirements fishers/exporter must report seahorses to species level. Many of the issues facing target seahorse fisheries are similar to ornamental fishes overall (with exception of cyanide fishing)

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Report from Working Group 2

Enforcement of a CITES listing

The Enforcement Working Group was tasked with discussing issues pertaining to the enforcement of CITES Appendix II requirements for the export and import of seahorses. The group was asked to 1) evaluate difficulties in distinguishing captive bred and wild-caught seahorses and tools and information that would be needed to enhance identification; 2) identify possible approaches to facilitate inspection of large volumes of dried seahorses; 3) address challenges faced by national authorities when issuing CITES permits in the seahorse industry; 4) evaluate difficulties in identifying seahorses and identify research, training and tools that are necessary to improve the ability of law enforcement to identify and verify CITES shipments of seahorses; and 5) identify methods to improve communication between Enforcement, Management and Scientific Authorities.

1. Discuss pragmatic ways to distinguish captive bred and wild caught seahorses

The participants discussed three possible avenues for distinguishing captive bred and wild caught seahorses: morphological differences between captive bred and wild caught specimens; methods of marking captive bred specimens; and the use of documentation.

Morphological differences between captive bred and wild caught specimens

The participants concluded that it may be possible, in some cases, to distinguish captive bred vs. wild caught live specimens of seahorses via visible damage to a specimen from predation, parasites, etc. However, the attendees made the following conclusions:

- The morphological indicators would not be consistent or reliable.
- The varied life histories of the different species of seahorses means that the capability to distinguish captive bred vs. wild caught live specimens would likely differ between species.
- The capability to distinguish captive bred vs. wild caught live specimens would be affected by the length of time a species had been in captivity; and methods of capture and transport.
- Long-term captive breeding efforts could eventually result in varieties of seahorses that exhibit colours or morphological forms that are not known (or common) in the wild. Documentation of these variations would be valuable indicators that specimens were captive bred.
- It would not be possible to determine whether dried specimens of seahorses were captive bred or wild caught using morphology.

Marking captive bred specimens

The participants discussed seven different possible methods for marking captive bred seahorse specimens, as follows:

- Collar tags (tags looped around the neck of seahorse specimens). Although this method would be easily instituted by captive breeding facilities, it would also be easily falsified and the tags may be lost in transport.
- Coloured polymer injected under the skin of specimens in a recorded pattern. This method would be both easily falsified and labour intensive.
- Coded wire tags inserted into the body of specimens. The attendees noted that this method had not been tested; that this method would be very labour intensive considering the large number and small size of specimens likely to be produced from a captive breeding facility; and that the method would be easily falsified.
- Natural morphological differences between the otoliths (the small bones in the internal ear of vertebrates) of captive bred vs. wild caught specimens. The attendees noted that these differences would likely not be consistent, plus examination of otoliths would require sacrifice of live specimens and laboratory analysis.
- Marking of the otoliths of captive bred specimens using stable isotopes such as strontium chloride. The attendees noted that this method would likely result in a high mortality rate
- Chemical marking of the skeleton (including the otoliths) using tetracycline. The pros to this method would be the ease in which it could be applied; that it couldn't be falsified and that it would be permanent. The con to this method would that verification by enforcement officers would require sacrifice of live specimens and laboratory analysis.

In general, the participants felt that the marking of captive bred specimens was not practical for routine enforcement of the trade in seahorses. However, marking could be useful in the process of certifying and monitoring captive breeding facilities and that marking could provide valuable forensic support for prosecution of seahorse smuggling cases.

Documentation

The participants noted that certification or registration of captive breeding facilities would provide documentation that could accompany shipments and provide additional information for enforcement (e.g. permit verification). In discussing this issue, the attendees noted the following:

- There is a need to include enforcement authorities in the certification or registration process.
- There is a need for routine monitoring and inspection of captive breeding facilities.

Recommendations:

- Chemical marking using tetracycline should be encouraged as part of the certification of captive breeding facilities and used to monitor these facilities.
- Marking methodology should be standardized among CITES Parties.
- Chemical marking should not be used for routine identification of CB specimens due to need to kill specimens.
- Certification or registration of captive breeding facilities should be instituted, and enforcement should be included in the process.
- Captive breeding facilities should be monitored through routine inspection by enforcement authorities.

2. List pragmatic ways to inspect shipments when handling and sampling large volumes of seahorses

The participants noted that this would mainly be an issue for shipments of dried specimens and that the response would depend on whether or not permits accompanied a shipment of seahorses. If no permits accompany a shipment, then there is a clear violation and there is no pressing need to identify what species the specimens are. An enforcement action is required no matter what species is involved.

If permits do accompany a shipment of seahorses, then permit validation is a required enforcement action. Permit validation must include the following actions:

- The specimens of seahorses in the shipment must be examined and identified in order to verify that the species listed in the permit match those being shipped.
- The volume of specimens in the shipment (whether number or weight of specimens) must be verified to be within the limits stated in the permit.
- If a minimum size limit is set as a condition of the permit(s) then specimens must be measured to ensure that the specimens in the shipment meet that size limit.

The participants also noted that the actions required to inspect shipments of seahorses may differ depending on whether the shipment contains a single species or multiple species.

Inspecting single species shipments:

Establishing that the volume of a shipment matches the permit(s):

- If a permit lists the number of allowed specimens, it may be necessary to count all of the specimens contained within the shipment.
- If permit lists the allowed weight of specimens, then verification of the permit is much less labour intensive (the specimens may be weighed together).
- It would be valuable to have a formula which could be used to convert the weight of a shipment into an approximate number of specimens in that shipment. This would possibly resolve the need to count all of the specimens in a shipment (when a permit lists number of specimens) and would allow for better data comparison between permits (e.g. those listing number of specimens and permits listing weight of specimens).

- Identification and (if required) measurement:
 - Identification and/or measurement of seahorse specimens is very time consuming. When large shipments of seahorses must be inspected it was recommended that a sub sample of specimens be taken for identification.
 - The sub sample must include specimens taken from different locations within the shipment to ensure that all of the contents are represented.
 - The number of specimens taken as a sub sample needs to be large enough to provide good representation of the specimens contained in the shipment. The size of a sub sample may be dependent on the specific country needs and available resources.
 - The use of sub samples is pragmatic, but will likely result in missed violations.

Inspecting multiple species shipments

The participants noted that shipments of multiple species mixed together will be much more difficult more difficult to inspect than single species shipments. This will present a major problem for countries which export multiple species or import from “hub” countries (those through which shipments from different countries transit en route to their final destination) where species may be mixed before re-export. The attendees also noted that shipments will need to be sorted and the specimens contained therein identified by the exporters in order to comply with permits.

- Establishing that the volume of a shipment matches the permit(s):
 - If the permit(s) lists the total number of specimens of each species it may be necessary to count all of the specimens of each species contained within the shipment in order to verify the permit.
 - If permit lists the allowed weight of specimens then each species will need to be separated in order to record a weight and verify the permit.
 - In either situation above, accurate identification of the different species will be necessary.
- Identification and (if required) measurement:
 - Identification of every specimen would be preferable – but this is unlikely to be practical for most shipments, unless there are a relatively small number of specimens contained within.
 - As for shipments of single species, it was recommended that when large shipments of mixed species of seahorses must be inspected, a sub sample of specimens should be taken for identification. The purpose of the sub sample is to verify the shipment does not contain undeclared species and that the permit conditions are met (e.g. species composition and ratio, size, source, etc.). It will be important to ensure that the sub sample represents the contents of an entire shipment.

Recommendations

- Parties should be reminded that permits for seahorse shipments need to be issued to the species level, and not just genus.
- Parties should be encouraged to use the weight of specimens (rather than number) on permits for any shipment of more than 1 kg.
- If possible, a crude conversion factor should be developed to determine the approximate number of specimens per kg for each species or group of species (for example by specimen size).
- When issuing CITES Export permits for shipments of multiple species of seahorses, exporting countries should add a condition that invalidates the permits if the species are not separated within the shipment. This would greatly assist the inspection process.
- Enforcement authorities should identify species for permit validation of large shipments by taking sub samples that represent the different areas of a container; provides a good representation of the species involved; and minimizes the chance of a missed violation.
 - o Sub sample(s) would be used to verify the shipment does not contain undeclared species and that the permit conditions are met.
 - o Countries should quantify the number of specimens required as a sub sample in consideration of their specific policy and logistic restrictions.

3. List and address the hurdles faced by national authorities when issuing CITES permits in the seahorse industry

The participants noted that it was an issue to be addressed by CITES Management and Scientific Authorities as it was not an enforcement problem. The attendees also noted that aspects of this issue were being discussed in other topics of Working Group 2 (e.g., the need for good communication between enforcement, Management and Scientific Authorities; or the need to include enforcement in monitoring activities).

4. Discuss problems and solutions for identifying seahorses

The participants noted that the problems and solutions for identifying seahorses varied depending on whether the specimens to be identified were live, dried or derivatives (e.g. used as an ingredient in pharmaceuticals).

- Shipments of live seahorses will generally have smaller numbers of specimens than shipments of dried seahorses and will therefore be easier to inspect from the point of view of volume.
- Shipments of live seahorses may provide a better paper trail due to the need for expediency of transport, and this may assist with inspection activities.

Problems and solutions for identifying dried seahorses

The attendees discussed this issue and noted the following:

- The seahorse identification guide produced by TRAFFIC and Project Seahorse was designed primarily to assist with the identification of dried specimens, and therefore will be of particular value for inspecting shipments of dried seahorses.
 - o Eventually the identification guide will be available as a hardcopy; on compact disk; and through the internet.
 - o The identification guide will be used by the Secretariat to produce pages for the *Identification Manual* and therefore the species descriptions will be translated to Spanish and French. However, there is a pressing need for translation of the guide to other languages, especially Chinese.
- Inspections of shipments of dried seahorses will be a lesser problem for source countries as they will have a limited number of species to consider when inspecting and identifying specimens. For example, only four species of seahorse are distributed in the waters of Mexico, so enforcement staff inspecting shipments of seahorses on export would not normally have to identify species other than these four.
- Inspections of shipments of dried seahorses will be a much greater problem for “hub” countries and those countries which import seahorses from “hub” countries. For example, enforcement staff in inspecting shipments of dried seahorses passing through Hong Kong would need to be familiar with many different species from many different countries.
- Trade in *Hippocampus kuda*, *H. kellogii* and *H. ingens* will be especially problematic for enforcement due to the morphological similarity of these species.
 - o The distribution of *H. ingens* does not overlap that of *H. kuda* and *H. kellogii*, so this problem may (in some cases) be resolved through documentation. However, distribution of *H. kuda* and *H. kellogii* overlap making inspection and identification of shipments of these species particularly problematic.
 - o Research is needed to establish a practical solution to this problem. The capability to identify *H. kuda* and *H. kellogii* through DNA analysis would be valuable. However, a more practical means of identifying these species needs to be established.
- Parties should be encouraged to support regional and/or national workshops for enforcement staff on the identification of seahorses. Such workshops would be valuable as they build both expertise and enthusiasm.
- Experts on seahorse identification need to be identified and placed in a database that is available to the Parties.

Problems and solutions for identifying seahorse derivatives

The attendees discussed this issue and noted the following:

- The seahorse identification guide produced by TRAFFIC and Project Seahorse will provide very limited assistance for identifying seahorse derivatives.
- There is currently no capability available for the forensic identification of seahorse species used in derivatives such as pharmaceuticals.
- Identification seahorse derivatives will best be accomplished through labelling of derivative products.

Recommendations

- Research should be directed at resolving the problems associated with identifying very similar species, particularly *H. kuda*, *H. kellogii* and *H. ingens*.
 - Research into forensic identification through DNA analysis would be valuable. The development of DNA analysis should meet the standards of forensic science.
 - Until this identification issue is resolved, countries should ensure that the legal status of *H. kuda* remains the same as *H. kellogii* (and vice versa).
- Resources should be located to hold national and/or regional species identification workshops. Countries with significant exports of multiple species should host identification workshops specifically designed for exporters.
- Resources should be located to translate the ID guide into languages in addition to English, French and Spanish.
- The development of a seahorse expert database should be encouraged..
- Exporters should be encouraged to pack live specimens in a manner that facilitates inspection and identification. Packing should always comply with the International Air Traffic Association (IATA) Live Animals Regulations.
- Countries should be encouraged to develop domestic legislation stating that if derivatives (such as pharmaceuticals) include CITES-listed animals or plants as ingredients on their packaging, then the ingredients will be considered accurate for the purposes of enforcement.
- Methods to assist with the identification of live specimens need to be developed in cooperation with non-governmental organisations, professional associations, and industry.

5. Communication between Enforcement, Management and Scientific Authorities

The attendees discussed this issue and noted the following:

- There are two different issues within this topic:
 - o The need for better intra-country communication between the enforcement authorities and Management and Scientific Authorities (e.g. the sharing of transaction records).
 - o The need for better inter-country sharing of exporter information between management and/or enforcement authorities.
- For many countries, communication between enforcement authorities (intra and inter) would be enhanced through better access to technology and capacity building opportunities (e.g. internet, workshops, training, international meetings, databases, etc.).
- There is a limit as to how much information can be shared by enforcement with Management and Scientific Authorities due the need for confidentiality that is inherent in enforcement actions (e.g. investigations leading to prosecutions).

Recommendations

- Parties should be encouraged to recognize and involve enforcement authorities in management activities such as permitting, monitoring of captive breeding facilities, etc.
- Resources need to be found and directed towards providing communication tools for enforcement authorities (e.g. internet access, workshops, training, international meetings, databases, etc.).
- Parties should be encouraged to foster intra and inter-country sharing of information on enforcement activities (e.g. exporters and importers involved in significant violations). This information may be significant for instigation of enforcement activities and/or affect permit issuance in source countries.

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Report from Working Group 3

Non-detriment findings

1. Discuss and define non-detrimental aquaculture for species of Hippocampus

There was considerable discussion of CITES captive-bred certificates, and the exemptions provided in the treaty for particular types of aquacultured organisms. If the following conditions are met, then a national Management Authority issues a certificate stating that specimens are captive bred and exempt from needing NDFs (as per Resolution 10.16):

- Operation produces F2 generation or beyond (or using techniques that yield F2), or is managed in a manner that has been demonstrated to be capable of reliably producing second-generation offspring in a controlled environment.
- Wild broodstock is rarely used, obtained in accordance with CITES measures, and recommended by the Scientific Authority to reduce inbreeding, dispose of confiscated animals, or (rarely) to obtain new animals for breeding.
- Closed system (no unintentional releases of gametes or individual specimens into the wild).
- Controlled environment (major environmental parameters controlled by humans). Parents mated and gametes exchanged in controlled environment.

The Secretariat member also pointed out that the Scientific Authority must be consulted (Resolution 10.3) when new operations apply for the issuance of captive-bred certificates for CITES-regulated trade. He also pointed out that there is no requirement that operations have to register with Management Authorities or the Secretariat for Appendix-II listed species.

It was clarified that any other type of seahorse aquaculture operation (that does not produce “bred in captivity” offspring as per the CITES definition) would need to obtain a CITES export permit prior to exporting specimens (dried or live). This would necessitate a formal NDF for all exports from these other aquaculture operations. This type of production is often called “born in captivity”, and typically produces F1 generation offspring in captivity. However, it is relatively easy for Scientific Authorities to issue NDFs for these types of exports because of the lower conservation risk and almost zero dependence on wild populations.

The chairman then encouraged the group to provide guidance on how to analyze such operations in the context of CITES. It was agreed that any minimum size limit for trade should not apply to aquacultured F1 or F2 seahorses. National authorities have a responsibility to validate aquaculturists' claims of F1 or F2 production, and ensure that a given operation is not a cover for wild harvest.

The group then discussed potential marking techniques, but the chairman reminded them that Working Group 2 (Enforcement) will be discussing this point in detail. Some participants mentioned the use of tetracycline dips and coded wire tags to mark small captive-born fishes. It was agreed that a "paper trail" or chain of custody documentation would have to suffice for distinguishing captive-born F1 seahorses until safe and acceptable marking techniques were widely available.

The group then provided some general criteria for acceptable and "non-detrimental" aquaculture operations:

1. The operation can repeatedly rear a sufficiently high percentage of young to market size to remain economically viable.
2. The operation has sufficient controls to prevent the release of gametes or individuals into the wild. Reintroduction of captive-bred seahorses should only occur in rare circumstances and with the approval of the IUCN Reintroduction Specialist Group.
3. The operation has minimal reliance on wild broodstock, which is taken only to reduce genetic inbreeding.
4. The operation has an adequately controlled environment to prevent the outbreak of disease, excessive mortality, etc.

It was suggested that it would be useful to create an inventory of current seahorse aquaculture operations to evaluate any suspicious expansion in national seahorse aquaculture operations.

2. Discuss how monitoring data and size limits for wild seahorse fisheries can be interpreted to separate "detrimental" and "non-detrimental" trade

The group started by talking about the utility of the minimum size limit (as per CITES Decision 12.54) compared to the utility of monitoring data for evaluating wild seahorse population status. The chairman clarified that the CITES treaty defined "species" not only as biological species, but also as national populations and geographically separate populations. This meant that CITES Scientific Authorities would have to evaluate trade for its impact at local and regional levels.

As the group began discussing the minimum size limit (currently under review by the CITES Animals Committee), they concluded that simple application of a size limit would not be sufficient to ensure non-detrimental seahorse trade in the long term. Participants quickly agreed that national monitoring programs

would be essential to evaluate the effects of trade and any benefits derived from imposing a minimum size limit. This led the group into a discussion of pragmatic and effective monitoring methods for wild seahorse populations. It became clear that countries would need to get some index of wild population status if they wished to ultimately limit or regulate harvest levels. It was agreed that almost all seahorse fisheries are data-poor, and complex modeling and quota setting are temporarily impossible for all seahorse exporting nations. However, the participants agreed that quotas are not the only way to establish non-detriment findings (NDFs) and that creative answers were needed in the interim while data on wild population status is gathered.

The chairman mentioned that some fisheries organizations, when faced with apparent overharvest of data-deficient species, have attempted crude but precautionary measures such as capping or limiting harvest to some fixed percentage of recent average landings. They then adjusted these limits up or down as they learned more about stock status and the fishery's dynamics.

A participant mentioned the idea of "sentinel fisheries", where geographically distinct but representative fisheries are intensely monitored. This could allow a wise use of limited funds and personnel to focus on a modest number of fisheries in major exporting areas. Such a program would involve trained observers collecting information at sea and at port on species harvested, discard rates, sex ratios, temporal and spatial patterns in fisheries, etc. Such "sentinel" seahorse monitoring programs could even be integrated into existing fishery monitoring programs where feasible, and would yield lessons about effective means to monitor populations and fisheries.

A participant from CONABIO intervened, and said that the group was focusing too much on long-term data collection and ignoring the short-term needs of Scientific Authorities in May 2004 when the listing goes into effect. It was agreed that the group would develop two lists of recommendations for this TOR:

- 1) short-term measures that Parties could use immediately after May 2004 to make conservative decisions about seahorse export permits; and
- 2) longer term minimum data needs that would assist in "adaptive management" of fisheries and exports.

It was explained that adaptive management is a common practice in many fisheries, where:

- a) initial conservative limits are placed on harvest and/or trade;
- b) monitoring programs are initiated; and
- c) monitoring results give feedback on the effectiveness of initial regulations, which are modified and improved as necessary.

The group agreed on a number of short-term measures, as below:

- Primary recommendation: establish a minimum size limit for exported seahorses, if necessary in the absence of reliable data on national seahorse population status
 - o It was understood that a final value for a uniform trade size limit had not been agreed on in the Animals Committee.
 - o Deliberations at AC20 (March 2004) and COP13 should resolve Decision 12.54 and result in a recommended trade size limit.
 - o In any event, the minimum size limit for traded seahorses would be a voluntary measure and Parties could choose to adopt it or reject it based on their particular situation.
- Auxiliary measure: consider “capping” or limiting exports to some portion of historic levels
 - o The Secretariat postulated that this measure might be better for the live animal trade. Project Seahorse participants countered that existing trade data don’t support a differential approach for live vs. dried seahorses.
 - o After much discussion about how any limits on historic exports may be perceived as arbitrary and capricious, it was agreed that exports could be simply capped at recent average levels when there is clear evidence that seahorse populations are being affected and are declining. Export caps are relatively easy to monitor via CITES permit issuance, and several countries would have adequate trade data to generate reasonably accurate estimates of recent (last 3-5 years) export volumes.
 - o Project Seahorse trade and population data could be used to determine degree of concern in various exporting Parties
- Auxiliary measure: cap effort via a limit on the number of licences to target fishers
 - o The group agreed this approach would be useful in areas where a target fishery is the main source of seahorse exploitation
- Auxiliary measure: consider the proportion of actual or potential seahorse habitat within current and planned national marine protected areas (MPAs). This could help Scientific Authorities gauge the extent of seahorse refugia, and the relative impact of a particular export on a nation’s seahorse population.

It was also noted by the group that any Party can develop complementary measures as they emerge and as more data are obtained, and that there may be other ways to do NDFs depending on the available information. The group noted the measures above would be voluntary, but can serve as useful recommendations while other measures are established. The Secretariat mentioned that any country could establish more and/or different measures (*e.g.* Brazil has already established quotas), and could ask the Secretariat to notify other Parties of such measures to facilitate their international enforcement.

The group also stressed the need for timely distribution of critical information to the Parties, before or shortly after the May 15, 2004 seahorse listing effective date. This included:

- The rapid publication of the updated 2000 Project Seahorse global trade report, with the required funding;
- A Notification to the Parties, discussing how nations can get information on pre-Convention seahorse “stockpiles”, minimum size implementation, workshop proceedings, and other relevant topics.
- Parties should inform the Secretariat of any special measures applicable to their seahorse exports and include these on any export permits as special conditions.

The participants then went on to describe the minimum data necessary for defensible and adaptive management of wild seahorse populations. It was agreed that two different types of data must be collected: population data and fisheries data, as described below.

Population data (collected via fishery-independent programs, or by sub-sampling commercial landings):

- Presence/absence
- Species composition
- Densities/abundance indices
- Sex ratio (males, females, juveniles)
- Size structure
- Reproductive status (males – pregnant/not pregnant)
- Habitats/depth of collection
- Variation in seahorse distribution in time and space

Fisheries data:

A participant also asked about the need to monitor domestic use of seahorses in addition to international trade. She hypothesized that monitoring domestic trade would be necessary for gauging the detrimental impact of potential exports. Governmental representatives and the Secretariat commented that few if any nations monitor internal trade in wildlife, and that this is interpolated by occasional scientific surveys of wild populations, industry consultation, and market studies.

A few participants stressed the need to make use of data “clearing houses”, where national authorities could extract important but elusive information on seahorse presence and absence, habitat maps, and densities. One participant mentioned that one could potentially estimate national seahorse population size by combining data on typical densities in particular habitat types and the occurrence of those habitats across a country’s coastal zone.

After agreeing on the minimum data sets desired for seahorse non-detriment findings, the group began discussing how a Scientific Authority could recognize the signs of detrimental or unsustainable trade. It was agreed that an unexpected change in any of the following parameters should signal potential problems in a given seahorse population:

- o Presence/absence
- o Size/age structure
- o Species composition
- o Relative abundance
- o Extirpations
- o Sex ratio
- o Habitat quality/quantity (would include invasive species, pollutants, etc)
- o Catch rates (per unit effort)
- o Trade rates (per unit effort)
- o Frequency of male brood pouch

The group noted that new fisheries would result in initial considerable declines in one or more of these parameters, but declines should not persist indefinitely. It is imperative for Scientific Authorities and fishery managers to consider what changes may be a normal response to extraction (i.e., sex ratio shifts in a sex-selective fishery), and which changes are “alarms” or signs of population collapse. The group agreed that removal rates need to be adjusted in the face of unexpected declines regardless of their cause (fishery or non-fishery).

The chairman encouraged a debate on what constitutes an “alarm” or a cause for concern when looking at changes in seahorse population parameters or fishery data. Some participants proposed that statistically significant changes should generate action or regulatory change. However, the chairman cautioned that many datasets might show considerable variance (particularly in early years) that would complicate the data and trend interpretation. Others felt that any decline are worrisome if unexpected, and should be cause for action.

Changes in population or fishery indices should be assessed over a given species’ estimated lifespan as a minimum time frame.

Scientific Authorities will need to assess the magnitude and meaning of any change, and advise Management Authorities accordingly. In so doing, they should consider how changes repeat across multiple datasets (e.g., several indices all show decline over the same time period).

It was agreed that the declines in population or fishery indices should be considered in relation to:

- The species' estimated lifespan (a decline is more worrisome for a long-lived species than a short-lived species)
- Their absolute magnitude (i.e., 20%, 50%, order of magnitude)
- Redundancy or repetition across multiple datasets (e.g., several indices all show decline over the same time period)

3. Develop potential methods to monitor, interpret, and control the effects of non-selective fishing gear on *Hippocampus* populations

The group decided that means to monitor and interpret the effects of non-selective fishing gear (i.e., bycatch) had already been addressed in TOR 2 and Working Group 1. However, the participants felt it was important to provide guidance to CITES Authorities and fishery agencies about how to ameliorate or reverse unsustainable bycatch of seahorses so that Appendix-II trade in these species could continue without detriment to wild populations.

One participant advocated the use of rotational harvest schemes to allow seahorse populations to recover from indiscriminate or excessive harvest. Another participant said that rotational harvest regimes had not succeeded in many parts of the world. Other possibilities to address non-selective fishing include:

- Temporal and spatial closures (e.g., no-take MPAs and no trawling zones)
- Zoning of fishing grounds (i.e., specifying which gear types are allowed in particular parts of fishable habitat). Zones might be established on basis of life history characteristics, such as depth preferences, seasonal movements, breeding cycles of a given *Hippocampus* species.
- Application of existing trawling bans when assessing sources of specimens destined for export. Many countries currently ban trawling in coastal waters, but have little or no enforcement and high levels of seahorse bycatch for international trade. Seahorses collected from these illegal fisheries should not be exported under CITES provisions for legal acquisition. However, it would require close collaboration between national Management Authorities, Scientific Authorities, and law enforcement agencies to enforce trawling bans in real time and upon permit issuance.

- Comparison of abundance in fished vs. non-fished areas (this would help gauge the impact of bycatch fisheries on seahorse populations)
- Gear management: National Authorities should consider the potential retention and mortality of undersized/immature seahorses relative to legal or adult seahorses in various gear types. Gear modification could possibly reduce bycatch of unwanted seahorses in other fisheries.

As per CITES Decision 12.53, national CITES authorities should consider sending these findings to appropriate fishery agencies, FAO, and regional fishery bodies for consideration and action.

National authorities should provide the results of monitoring and research programs to international “clearinghouses” to promote maximum exchange of information on seahorse fisheries.

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